WATER-SHEDDING INDOOR WALL MOUNTED CABINET

BACKGROUND OF THE INVENTION

The present invention relates generally to indoor wall mounted cabinets, and more particularly, to cabinets that have ventilation and water shedding features. Such features are particularly appropriate for use in housing sensitive electrical and/or electro-mechanical components, such as those frequently found in the telecommunications field.

DESCRIPTION OF THE RELATED ART

In many office buildings today it is common for a business entity to have a room where sensitive network hardware, computers, telephone lines and switches are located. These rooms are usually windowless and located in less desirable locations of a floor plan. They can also contain fuse or breaker boxes and transformers providing electrical service to the building, floor of the building, or portion of a floor. Such rooms are generally kept locked to thus deny access to the general workforce.

For rooms which contain principally or exclusively telecommunications equipment, access may be restricted to technicians employed by the company providing telecommunications services to the business. These are often the Regional Bell Operating Companies (RBOCs) but could be any number of non-Bell telecommunications providers. However, any given room may be accessed by computer technicians working for one or more computer service companies, telecommunications technicians working for one or more telecommunications service providers, and/or electricians.

The ambient conditions in these rooms can vary, but in general, conditions range from heated and air conditioned, to non-heated and non-air conditioned. Thus, while many of these "equipment" rooms may approximate the temperature and humidity levels of the worker workspace of the building, it is also possible that the temperature and humidity levels can vary approximately with outdoor ambient conditions. In any event, variations of temperature within the room, and differential temperatures between equipment, flooring, and the air, can produce condensation which, if allowed to be in contact with the equipment, could cause electrical shorts and/or other equipment failure.

It is generally known to provide wall-mounted cabinets to house electrical, computer and/or telecommunications equipment. The known cabinets can serve many purposes. For example a locked cabinet, or breaker box, can keep non-authorized personnel from accessing electrical equipment, thus avoiding accidental electrical shock. Breaker boxes typically have piano-type, vertically oriented hinges supporting a door and no upper ventilation holes (although punch-outs used to admit wiring through the top will inherently provide some ventilation).

Telecommunications equipment, such as optical communications gear, will generate heat which needs to be ventilated simply and cost effectively. The most cost effective and simple way to vent heat is to provide perforations in the upper surface of the cabinet so that heat rising naturally via convection escapes through the upper surface perforations. However, while allowing expulsion of heat, the perforations can also provide an entrance for water, for example, from a dripping fire sprinkler system, a leaking roof, or condensation forming above the cabinet. Water admitted from such sources could cause adverse effects on the optical communications equipment.

Equipment rooms may have limited space within which technicians can work, and thus, hinged doors or housings which are fully coupled to a main cabinet box may create problems of space. For example, a piano-hinged door may be opened to gain access to a cabinet, but the hinged door may swing into contact with other electrical equipment or connections, thus creating a health risk to the technician.

A need exists for an equipment cabinet that allows the interior of the cabinet to ventilate heat while at the same time keeping water from entering the interior. A solution that fulfills this need will naturally be constrained by the important goal of maintaining the relatively inexpensive nature of equipment cabinets that follows from a desire for simplicity in design.

SUMMARY OF THE INVENTION

The present invention solves the aforementioned problems by providing a wall-mounted cabinet having a front surface, at least two side surfaces and a top surface collectively defining an interior space, means for fixedly mounting the cabinet in a position on but spaced from a wall, a vent located at an upper portion of the cabinet, and a water-deflecting plate located in proximity to the vent, and being adapted to prevent ingress of water into the interior of the cabinet while permitting egress of heat from the interior of the cabinet.

The cabinet is preferably of rectangular shape and includes a front wall, two opposite side walls, a bottom wall, and a top wall. The walls are preferably planar, define an interior space for housing electrical components, such as telecommunications equipment. The walls are preferably solid sheet metal panels of the type that can be

readily stamped, bent or otherwise shaped as desired. Other materials and forming methods can be employed to construct the cabinet.

As will be described in greater detail below, the bottom wall is preferably associated with a stationary, wall mounting component of the cabinet, while the other walls are associated with a pivotally movable cover component. The top wall has no perforations and thus prevents water from dripping into the interior of the cabinet.

Another aspect of the present invention is to provide a wall-mounted cabinet having a first component adapted to be fixedly mounted on a vertical interior wall, a second component detachably and pivotally connected to the first component, and being pivotally movable between a first, closed position and a second, detached position, an interior space formed by the first and second components when disposed in the first, closed position, venting means for venting air from the interior space, and diverting means, disposed in spaced relation to the venting means, for diverting water passing through the venting means away from the interior space.

Preferably, the first component includes a back wall having an upper end and a lower end, a bottom wall provided at the lower end of the back wall, and spacer means formed in the back wall to maintain the back wall of the first component in spaced relation to the vertical interior wall. The second component preferably includes a front wall, two opposite side walls and a top wall, wherein the top wall has a rearward longitudinal edge, and wherein the vent means is a gap formed between the rearward longitudinal edge of the top wall and the upper end of the back wall of the first component.

In one embodiment, the diverter means is an angled plate formed along the upper end of the back wall of the first component, and extending substantially the length of the gap, the angled plate. The angled plate may include a proximal longitudinal edge connected to the upper end of the back wall of the first component, and a distal longitudinal edge extending upwardly relative to the upper end of the back plate at an angle.

The spacer means preferably includes a plurality of protrusions formed in the back wall of the first component, each having an opening for receiving fastener means adapted to be anchored in the vertical interior wall. When mounted on the interior vertical wall, the protrusions form a space between the vertical interior wall and the back wall of the first component. The space is open at the top, bottom and sides, so that if water enters the ventilation gap, the water is diverted towards the space and may flow by gravity downwardly along the surface of the back plate facing the opposing surface of the vertical interior wall. The angle of the angled plate is preferably selected to cause or facilitate the flow of water entering the gap towards the space between the back wall of the first component and the back wall of the vertical interior wall.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a wall mounted cabinet according to a preferred embodiment of the present invention, shown mounted on a wall;

Figure 2 is an exploded, perspective view of the wall mounted cabinet of Figure 1, showing details of the preferred two-part construction of the cabinet;

Figure 3 is a perspective view of the first component of the wall mounted cabinet of Figures 1 and 2, and showing details of the mounting brackets and water diversion plate;

Figure 4 is a side elevational view of the wall mounted cabinet of the previous figures, and showing directional movement of air and water relative to the cabinet interior, as well as details of the cooperative connection between the pivot pins of the second component and the mounting brackets of the first component; and

Figure 5 is an enlarged view of the connection of the two components shown in Figure 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figure 1, a wall mounted cabinet 10 is mounted on a wall 12. The wall 12 is preferably an interior wall within a room that is may be designated as an equipment room to contain electrical, telecommunications, and/or computer equipment. While the cabinet 10 is preferably located in such a room, it is also possible that the cabinet is mounted on a wall of other interior spaces that are less confined and perhaps designated for multiple uses. It is also possible that the cabinet could be located on a wall that is semi-enclosed but covered. Thus, the term "interior" could encompass building structures that are not confined by four walls, a ceiling and a floor. The term "interior" denotes a space that is not directly exposed to the elements, although the preferred location of the cabinet 10 is in an interior space defined in the traditional sense.

Moreover, the cabinet 10 of the present invention is intended to be mounted on a vertical wall, rather than horizontal or sloping walls. This requirement is to orient the air

venting and water deflecting structures that form a part of the present invention, the details of which will be more fully described below.

The cabinet 10 is preferably rectangular in shape, and includes a front wall 14, two opposite side walls 16 and 18, a bottom wall 20, and a top wall 22. The walls are preferably solid planar panels which define an interior space for housing electrical components, such as telecommunications equipment. The walls are preferably solid sheet metal panels of the type that can be readily stamped, bent or otherwise shaped as desired. Other materials and forming methods can be employed to construct the cabinet. Moreover, other shapes can be used, such as curved, rather than planar, surfaces as would be the case if the side walls were rounded or curved to blend into the front wall. The depth of the cabinet, defined by the width of the side walls, top wall and bottom wall, can vary according to the intended end use of the cabinet; however, the depth of the illustrated embodiment is intended to accommodate certain optical telecommunications equipment manufactured by the assignee herein, and sold under the trademark FLASHWAVE. This equipment includes heat generating, sensitive electronic components that mandate that the interior space of the cabinet should be ventilated (to exhaust heated air) but sheltered to prevent exposure to water and/or debris, and accidental or inadvertent disturbance by unauthorized technicians.

Referring to Figure 2, the wall-mounted cabinet is preferably an assembly of two components. The first component 24 is adapted to be fixedly mounted on a vertical interior wall, such as wall 12 shown in Figure 1. The first component 24 preferably includes a back wall 26 having an upper end and a lower end. The bottom wall 20 of the cabinet is formed at a right angle to the back wall 26, and may be integrally formed

therewith. Thus, the bottom wall 20 and the back wall 26 may be formed by bending, stamping, or otherwise shaping a single sheet of metal.

The upper end of back wall 26 includes a pair of mounting brackets 28 and 30 formed, connected or otherwise disposed at opposite sides of the back wall 26. The mounting brackets 28 and 30 may be the upper end portions of thin side panels 32 and 34, respectively, which may be integrally formed with the back wall 26.

Other features of the first component may include structures such as mounting brackets 36, 38 and 40 which can be used to secure equipment within the cabinet. Also, in a preferred embodiment of the invention, the back wall is slightly spaced from the interior vertical wall. In order to provide this spacing, the back wall 26 can be provided with a plurality of protrusions42, 44, 46 and 48, preferably spaced around the periphery of the back wall 26. The protrusions extend outwardly from a rear surface of the back wall 26, and may be provided with a central bore for receiving fastening means.

When the back wall 26 is made of sheet metal, the protrusions can be easily formed by stamping. The stamping will form an indentation on the inside surface of the back wall 26 and a correspondingly shaped protrusion on the opposite surface of the back wall 26.

The fastening means may include threaded fasteners 50 (only one for protrusion 44 being illustrated) with or without washers 52. Each fastener 50 passes through the central bore of each corresponding protrusion and engages the wall 12 either by means of threads engaging the wall, or by a nut or other cooperative fastener device threadedly engaging the distal end of the fastener 50. Other fasteners and fastener means, and spacer means can be used, including nails, screws, bolts, rivets, or virtually any other means that

can fixedly couple the first component 24 to the vertical interior wall of the room with a space formed therebetween. The space, formed by the outer surface of the vertical interior wall and the outer surface of the back wall 26, is open at least at the top and bottom, so that water can enter the space at the top and exit the space at the bottom, without entering the interior of the cabinet.

As seen in Figure 3, the first component has a plate 58 formed at the upper end of the back wall 26. The plate 58 functions to divert water entering the top of the cabinet to the vertical wall, to thus flow by gravity down the wall and away from the interior of the cabinet. The plate 58 extends outwardly relative to the back wall 26 and upwardly relative to the vertical interior wall. The preferred angle of the plate 58 can be selected to encourage gravity flow of water along its outer surface. As illustrated, the angle is approximately 45 degrees.

The plate 58 can be easily formed by bending the upper end of the back plate at the desired angle, thus forming a plate that is integrally formed with the back wall. However, the plate 58 could be separately formed and attached to the upper end of the back wall 26.

As further seen in Figure 3, each of the mounting brackets 28 and 30 includes a flat upper, horizontally oriented upper edge 60 and 62, respectively, and each upper edge has a notch 64 and 66 respectively formed therein. The notches and upper surfaces of the brackets play an important role in forming the detachable, pivotal connection between the first component and the second component.

A second component 54 is pivotally and detachably connected to the first component 24, and includes the front wall 14 of the cabinet, the side walls 16 (not visible

in Figure 2) and 18, and the top wall 22. These walls, in the preferred embodiment, are flat metal panels that are bent, shaped or otherwise formed of sheet metal. However, they could be formed by connecting individual panels to each other. In general, the first component 54 forms a cover that includes a substantially horizontally oriented top wall 22 that has no perforations for venting heated air from an interior space within the cabinet.

The brackets 28 and 30 are used to form a pivotal and detachable connection between the first component 24 and the second component 54, as will be described in more detail below. In general, the second component 54 is detachably and pivotally connected to the first component, and is pivotally movable between a first, closed position and a second, detached position. A feature of the invention is that the cover or second component is lifted by a technician and caused to rotate upwardly through a limited range of angular motion. Afterwards, the pivotal connection is released and the cover is separated from the first component, and can be conveniently placed in an out-of-the-way location, such as on the floor below the cabinet resting against the interior wall of the room.

When the first and second components are in the closed position, as seen in Figure 1, an interior space is formed by, and between, the first and second components. This interior space is preferably ventilated to expel heat but the ventilation means does not allow entry of water. This is accomplished according to the present invention using venting means for venting air from the interior space, and diverting means, disposed in spaced relation to the venting means, for diverting water passing through the venting means away from the interior space.

As seen in Figures 1 and 2, the cabinet may include louvers 56 which provide a venting function, but the louvers are optional, and are not intended to form part of the present invention. Indeed, because of the venting features of the present invention, conventional louver-type vents can be avoided. The conventional louver 56 consists of a slot-like opening having a dome or protrusion above the opening to keep water from entering. When using stamped metal parts, the louvers 56 can be integrally formed with the panels on which they are formed, such as the front wall 14 and the side walls 16 and 18.

Referring now to Figure 4, the cabinet 12 is seen mounted on the wall 10, which is preferably vertically oriented and within a room or space of a building designated for electrical, computer or telecommunications equipment. The cover component 54 includes a pair of pivot pins 68, one mounted on the interior of each of the side walls 16 and 18 in an upper portion thereof, near the top wall 22. Each pin mates respectively with notches 64 and 66 so that in the closed position, the weight of the cabinet cover, or second component 54, is supported by the mounting brackets 28 and 30.

In the closed position, a gap 70 is formed between the outer surface of the wall 10 and an inner, longitudinal edge of the top wall 22. The width of the gap 70, shown by the broken lines in Figure 4, is thus the distance between the surface of wall 12 and the edge of the top wall 22. The length of the gap 70 corresponds to the length of the top wall 22, which is the same as the bottom wall and the front wall. The width of the gap 70 also corresponds to the difference between the width of the side walls 16 and 18 and the width of the top wall 22.

As shown by directional arrow "A" heated air created by heat-generating components (not shown) to be mounted in the cabinet rises and passes through the gap 70. The gap thus has an advantage over louvers in that the gap 70 is an opening above, and thus, in more direct fluid communication with, the heat sources.

While the gap 70 provides the advantages noted above, there would otherwise be a tendency for water to enter from above into the interior of the cabinet. The plate 58 thus prevents water from entering the cabinet 12 by extending from the back wall 26 upwardly and outwardly, across the width of the gap 70 to deflect any water from entering the gap 70 to flow along the outer surface of the plate 58, towards the gap 72 formed between the outer surface of the wall 12 and the outer, opposing surface of the back wall 26. The gap 72 is open at the top and bottom so that water passing through the gap by gravity can exit the gap at the bottom and not accumulate anywhere in the vicinity of the cabinet. Water flow is generally indicated by the directional arrows of Figure 4 pointed in the downward direction.

A latch 74 is provided at the lower end of the front wall 14 to secure the second component 54 in the closed position shown in Figure 4. The latch is preferably provided with a lock to prevent unauthorized or accidental access to the interior of the cabinet.

The detachable and pivotal connection between the two components will now be described with reference to Figure 5. Pivot pins 68 extends radially inwardly from the inner surfaces of respective side walls 16 and 18, and may be fixedly connected to these surfaces via any suitable means, including interference fit within a corresponding mounting hole, riveting, welding, or other boding means. Alternatively, there could be a single pivot rod that extends from one side wall to the other, each opposite end being

secured to the side walls. The pins 68 (or rod) rest in the notches 64 and 66 as described previously to permit rotation or pivoting motion about an axis "X".; The axis X is substantially horizontally oriented, parallel to the front and back walls, and perpendicular to the side walls 16 and 18. In the closed position, the top wall 22 is substantially parallel to the upper edges 60 and 62 of the mounting brackets 28 and 30. Each mounting bracket, such as bracket 30 (Figure 5) has a cut-away corner defined by an angled edge 76 which extends between the top wall 22 and the rearward edge 78 of the side wall 18. In the closed position, the inward, longitudinal edge 80 of the top wall 22 is spaced from the upper edge 62 of the mounting bracket 30.

Someone seeking access to the interior of the cabinet would first unlock the latch 74, and then pull the second component outwardly from the wall 12. This pulling force will cause the second component 54 to pivot through an angle "P" until the longitudinal edge 80 of the top wall 22 abuts the upper edge 62 of the mounting bracket 30. At this point, further pulling force causes the second component to pivot about a new pivot axis, defined as the point where the longitudinal edge 80 abuts the upper edge 62. As the second component 54 pivots about this new pivot axis, the pivot pins 68 begin to slide upwardly along the angled surface 68A of the respective notches 64 and 66. When the pins reach the upper edges 60 and 62, they separate from the notches and the second component can be lifted away from the first component. Once separated, the second component can be place on the floor, out of the way of the service technician, engineer or other authorized personnel who need access to the interior of the cabinet.

The initial angular motion, manifest by rotation about axis X, is necessary to separate the latch 74 from its complementary components mounted on the bottom wall

20, or simply to separate the bottom wall from the front wall. Moreover, features of the side walls 16, 18 at their lower ends may cooperate with features of the side panels 32 and 34 at their lower ends, or the bottom wall 20, to provide a snug fit when the two components 24 and 54 are in the closed position. The initial rotation or pivotal movement allows separation of these features.

To reassemble the two components, the cover component (second component 54) is positioned with the lower end portion held outwardly at a slight angle from the wall as the pins 68 are place in the notches 64, 66. Once the pins engage the notches, the lower end of the cover component can be rotated towards the wall 12 until the latch 74 is engaged.

It can thus be seen that in the closed position, the plate 58 is positioned to deflect any water entering the gap 70 towards the gap 72 and away from the interior of the cabinet. The hinge arrangement described herein is intended to allow opening of a cabinet partially by pivotal movement and partially by translational movement, the latter occurring as the cover is lifted away once the pivot pins separate from the notches. It is also within the scope of the invention to provide detachable connection that does not interfere with a heat emitting gap or vent and a water deflecting plate which is disposed in proximity to the vent. This is accomplished by providing the aforementioned compound motion: first pivotal movement about a first pivot axis, second pivotal movement about a second pivot axis and then translational movement once the complementary pivotal structures, i.e., the notches 64, 66 and the pivot pins 68, separate from each other.